

* Combined stresses.

13/10/2015
مراجعة الامتحان

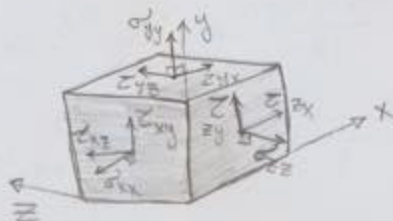
MR
MR

14

$$\tau_{zy} + \tau_{zx} + \sigma_{zz}$$

$$\tau_{xz} + \tau_{xy} + \sigma_{xx}$$

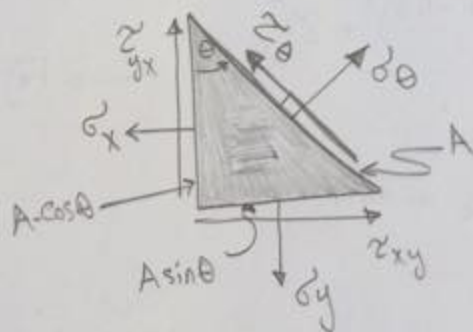
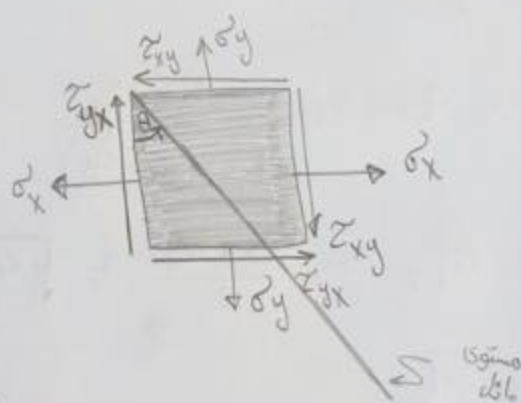
$$\tau_{yx} + \tau_{yz} + \sigma_{yy}$$



tensor

$$\begin{vmatrix} \sigma_{xx} & \tau_{xy} & \tau_{xz} \\ \tau_{yx} & \sigma_{yy} & \tau_{yz} \\ \tau_{zx} & \tau_{zy} & \sigma_{zz} \end{vmatrix}$$

* plan stresses.



$$\sigma_{\theta} \cdot A = \sigma_x \cdot A \cos \theta + \sigma_y A \sin \theta \sin \theta + \tau_{xy} A \sin \theta \cos \theta + \tau_{yx} \cdot A \sin \theta \cdot \cos \theta$$

$$\sigma_{\theta} = \sigma_x \cos^2 \theta + \sigma_y \sin^2 \theta + 2\tau_{xy} \sin \theta \cdot \cos \theta +$$

1b)

$\sin^2 \theta = \frac{1}{2} (1 - \cos 2\theta)$
 $\cos^2 \theta = \frac{1}{2} (1 + \cos 2\theta)$

$\sigma_{\theta} = \frac{\sigma_x + \sigma_y}{2} + \frac{\sigma_x - \sigma_y}{2} \cos 2\theta + \tau_{xy} \cdot \sin 2\theta \rightarrow (1)$

$\tau_{\theta} = \frac{\sigma_x - \sigma_y}{2} \sin 2\theta + \tau_{xy} \cdot \cos 2\theta \rightarrow (2)$

$\frac{d\sigma_{\theta}}{d\theta} = -(\sigma_x - \sigma_y) \cdot \sin 2\theta + 2\tau_{xy} \cdot \cos 2\theta = 0$

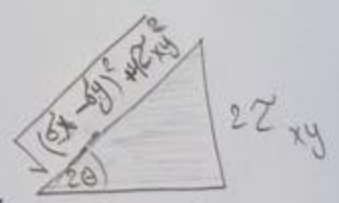
وقت تان
الطاقة

$\frac{d\sigma_{\theta}}{d\theta} = 2\tau_{\theta} = 0$

$\tau_{\theta} = 0$

الذي عليه
 Note: $\tau_{\theta} \leftarrow$ الحالة المستوي أكبر واجهاد عمودي تكون قيمتها يساوي صفر.

$\tan 2\theta = \frac{2\tau_{xy}}{(\sigma_x - \sigma_y)} \rightarrow (3)$



$\sigma_{1,2} = \frac{(\sigma_x + \sigma_y)}{2} \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2} \rightarrow (4)$

$\sigma_1 = \max \quad \sigma_2 = \min$

الذي عليه
 في حالة المستوي أكبر واجهاد مماسي تكون قيمة σ_{θ} يساوي $\frac{\sigma_x + \sigma_y}{2}$

$\frac{d\tau_{\theta}}{d\theta} = 0$

$\tan 2\theta = \frac{-(\sigma_x - \sigma_y)}{2\tau_{xy}} \rightarrow (5)$

$$\tau_{\max} = \pm \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2} \rightarrow \boxed{6}$$